

What is claimed is:

1. An internal combustion engine with a fuel cell in an exhaust system, said engine comprising:

a fuel cell having a fuel electrode side thereof connected with an exhaust passage of said internal combustion engine;

a fuel supply system that supplies power generation fuel for said fuel cell to an exhaust passage at a location downstream of said internal combustion engine and upstream of said fuel cell; and

a supply amount control part that controls an amount of power generation fuel supplied by said fuel supply system.

2. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 1, wherein said supply amount control part controls the amount of power generation fuel supplied by said fuel supply system in such a manner that an amount of electric power generation of said fuel cell becomes equal to a target amount of electric power generation.

3. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 2, further comprising a fuel amount detection device that detects an amount of power generation fuel contributing to the power generation of said fuel cell, wherein said supply amount control part controls the amount of power generation fuel supplied by said fuel supply system based on the result of detection of said fuel amount detection device.

4. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 3, wherein when the amount of power generation fuel contributing to the power generation of said fuel cell detected by said fuel amount detection device is smaller than a target amount, said supply amount control part increases the amount of power generation fuel supplied by said fuel supply system.

5. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 1, further comprising a temperature detection device that detects a state of an element related to the temperature of said fuel cell, wherein said supply amount control part controls the amount of power generation fuel supplied by said fuel supply system based on the result of

detection of said temperature detection device.

6. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 5, wherein when the temperature of said fuel cell is lower than a prescribed temperature, said supply amount control part decreases the amount of power generation fuel supplied by said fuel supply system.

7. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 1, further comprising a combustion device, wherein said fuel supply system supplies an exhaust gas discharged from said combustion device to said exhaust passage at a location downstream of said internal combustion engine and upstream of said fuel cell.

8. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 7, wherein said fuel supply system supplies the exhaust gas discharged from said combustion device to said exhaust passage at a location downstream of said internal combustion engine and upstream of said fuel cell, with combustion in said combustion device being performed with a mixture of a rich air fuel ratio which is a lower air fuel ratio than the stoichiometric air fuel ratio.

9. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 7, wherein said fuel supply system supplies an unburnt gas discharged from said combustion device to said exhaust passage at a location downstream of said internal combustion engine and upstream of said fuel cell, without combusting fuel in said combustion device.

10. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 7, wherein said supply amount control part controls the amount of power generation fuel supplied by said fuel supply system by changing an air fuel ratio of a gas combusted in said combustion device.

11. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 10, wherein when the temperature of said fuel cell is raised, said supply amount control part makes the air fuel ratio of said gas combusted in said combustion device to be a value in the vicinity of the stoichiometric air fuel ratio.

12. The internal combustion engine with a fuel cell in an exhaust system

as set forth in claim 1, further comprising a catalyst having oxidation capability that is installed on said exhaust passage at a location upstream of said fuel cell and downstream of said fuel supply system.

13. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 7, further comprising a catalyst having oxidation capability that is installed on said exhaust passage at a location upstream of said fuel cell and downstream of said fuel supply system, wherein when said internal combustion engine is operated with a mixture of a rich air fuel ratio, said supply amount control part adjusts the amount of power generation fuel supplied by said fuel supply system by making an air fuel ratio of a gas combusted in said combustion device to be a lean air fuel ratio which is a higher air fuel ratio than the stoichiometric air fuel ratio.

14. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 1, further comprising a catalyst having oxidation capability that is installed on said exhaust passage at a location downstream of said fuel cell.

15. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 14, further comprising an oxygen supply device that supplies oxygen to said catalyst having oxidation capability.

16. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 15, wherein said oxygen supply device supplies the oxygen discharged from an air electrode side of said fuel cell to said catalyst having oxidation capability.

17. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 1, further comprising a heat exchanger installed on said exhaust passage at a location downstream of said fuel cell.

18. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 17, further comprising an air supply passage that has said heat exchanger installed thereon and is connected with an inlet side of an air electrode of said fuel cell, wherein air whose temperature is raised due to the heat of an exhaust gas in said heat exchanger is supplied into said air electrode of said fuel cell through said air supply passage.

19. The internal combustion engine with a fuel cell in an exhaust system as set forth in claim 7, further comprising: a heat exchanger installed on said exhaust passage at a location downstream of said fuel cell; and an air supply passage that has said heat exchanger installed thereon and is connected with said combustion device, wherein air whose temperature is raised due to the heat of an exhaust gas in said heat exchanger is supplied into said combustion device through said air supply passage.